BAYOU COCODRIE TMDL FOR DISSOLVED COPPER

SUBSEGMENTS 060201

Louisiana Department of Environmental Quality
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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody.

Bayou Cocodrie flows from its headwaters, at the outlet of Lake Cocodrie in South Central Louisiana, to its confluence with the Bayou Boeuf / Cocodrie Diversion Canal. The Bayou Cocodrie subsegment 060201 is listed on the 1998 Section 303(d) List as not fully supporting the water quality standard for dissolved copper and dissolved lead. These parameters were assessed to be above the water quality standard, based on sampling and lab techniques that did not adher to the "Clean Methods" guidelines. It was decided to retest the water body using the "Clean Method" procedures. Between the months of July and October in 1999, five metals samples were taken. The sample results showed that the dissolved copper exceeded the subsegment's water quality criteria. The dissolved lead was meeting the water quality criteria. Thus a TMDL has been developed for dissolved copper in Bayou Cocodrie.

For the purpose of TMDL development, the dissolved copper numerical criteria was calculated based on the freshwater chronic value for aquatic life protection using the five year average hardness value from the LADEQ water quality ambient station 0103 (Bayou Cocodrie near St. Landry). The dissolved copper numerical criteria value was determined to be 2.66 ug/l. For the purpose of this TMDL, dissolved copper was considered to be a conservative parameter and was treated as such. Using the 7Q10 flow from the Bayou Cocodrie water quality model for dissolved oxygen and the dissolved copper numerical criteria value, a TMDL was calculated for the water body. The TMDL for dissolved Copper in Bayou Cocodrie was calculated to be 0.691 pounds per day.

The TMDL was then allocated to its headwater, incremental (nonpoint), point source load and margin of safety components. The headwater and incremental load components were calculated using the headwater and incremental flows. These flows were determined from the calculated headwater 7Q10 and Bayou Cocodrie water quality model for dissolved oxygen respectfully. The measured dissolved copper values relating to these load components were determined from the LADEQ ambient sites on Spring Creek and the Lake Chicot outlet.

1. **Introduction**

The Bayou Cocodrie subsegment 060201 was tested during July through October for metals using the "Clean Metals" techniques. The sample results showed an excedance with dissolved copper thus requiring a TMDL for this parameter. A TMDL for dissolved copper was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL can also establish the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2. **Study Area Description**

2.1 Bayou Cocodrie, Segment 0602

Bayou Cocodrie flows from its headwaters at Cocodrie Lake through the town of St. Landry to the Bayou Bouef / Cocodrie Diversion Canal thence to Bayou Courtableau thence to Bayou Teche. The Vermilion-Teche River Basin lies in the Western Gulf Coastal Plain ecoregion. The watershed is characterized as plains/prairie, and the land is generally flat with a very gradual slope toward the Gulf of Mexico. The predominant land use in the Vermilion River watershed is agricultural, consisting of cropland and pasture and comprising approximately 64.1% of the total acreage Land use in the Vermilion River watershed, Segment 0602, is shown in Table 1. (LDEQ, 1993) Average annual rainfall in the Vermilion-Teche River Basin is near 60 inches, and average annual temperature is 68°F.

Table 1. Land use in Segment 0602, Vermilion River watershed

LAND USE	ACREAGE	PERCENTAGE (%)
Agriculture	676,490	64.1
Forest	245,115	23.2
Wetland	73,230	6.9
Urban	46,942	4.5
Water	5,180	0.5
Barren	4,258	0.4

2.2 Water Quality Standards

The designated uses for Bayou Cocodrie include both primary contact recreation, secondary contact recreation, propagation of fish and wildlife and outstanding natural resource water. Louisiana's water quality "metals criteria are based on dissolved metals concentrations in ambient waters.

Hardness values are averaged from two-year data compilations contained in the latest Louisiana Water Quality Data Summary or other comparable data compilations or reports." The two-year data compilations are no longer being generated, so the hardness values measured during the "Clean Metals" sampling was used for assessment purposes.

2.3 Identification of Sources

The suspected major source is the CLECO Evangeline, LLC plant located near the town of St. Landry. The facility has multiple discharges associated with the operation of a steam electric generating plant as well as an intermittent discharge of chemical and non-chemical metal cleaning waste. Other point and non-point sources could also be contributing to the problem but none were located at this time.

3. **TMDL Load Calculations**

3.1 Critical Load Determination

The dissolved copper TMDL load was calculated using the water quality criteria value. This criteria value was calculated from the freshwater chronic criteria equation (Environmental Regulatory Code, Part IX. Water Quality Regulations 1999, page 139, chronic = $e^{(0.8545[\ln(\text{hardness})]-1.3860)}$) for dissolved copper.

The average hardness value used in this equation was determined from the historical data measured on Bayou Cocodrie at St. Landry, LADEQ WQ ambient site #0103. This is the site that was also used for the water quality assessment purposes. The five year (1993-1998) average value was used.

Dissolved copper was treated as a conservative parameter. The following equation was used to calculate the dissolved copper TMDL load.

Dissolved Copper TMDL, pounds/day = (Metal Criteria, mg/l) x (Critical Flow, mgd) x 8.345

For development of this TMDL, the critical (7Q10) flow was used to simulate critical dilution conditions.

See Appendix for the calculation sheet.

3.2 Load Allocation (LA)

The load allocation for this TMDL consists of the headwater component and the incremental flow coming from non-point sources.

Using information from the ftn Associates, Ltd water quality model's summer projection for dissolved oxygen, the incremental flow was determined to be zero. Thus with a zero flow the incremental load component is zero for this critical annual projection.

The headwater component load was calculated using the average dissolved copper value from the Spring Creek LADEQ ambient site #0099. The data used to determine this average value were measured using the "Clean Methods" techniques for metals between the months of July and October of 1999. This site's data was used because it is one of the major headwaters to Cocodrie Lake and is the best representative of the headwater water quality that was available. The headwater critical flow used was calculated from the USGS historical flow data on Bayou Cocodrie at Clearcreek. This data was tabulated and a 7Q10 was determined in a 1993 report by F. Lee, M. Forbe and D. Everett. The cover sheet and appropriate page of the report is in the Appendix. The headwater component load in pounds/day was calculated using the equation on page 5 of this report. The calculation of this load is shown in the Appendix.

3.3 Wasteload Allocation (WLA)

The WLA component load was calculated by subtracting the LA component load from the TMDL; eighty percent of this load difference was assigned to the point source component load (WLA) and the other 20% was allocated to the margin of safety. This is in accordance with the Louisiana Total Maximum Daily Load Technical Procedures. These calculations are shown on the worksheet shown in the Appendix.

3.4 Seasonal Variability

The water quality criteria for dissolved copper is an annual value thus the TMDL is based on annual critical flows and criteria.

3.5 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit, in this case 20% as described in 3.3. In this TMDL for dissolved copper, conservative assumptions have been used and therefore, there is also an implicit margin of safety. The major conservative assumptions were:

- Using critical flow for load calculation.
- Used the minimum detection limit for the headwater dissolved copper concentration. All samples were below the detection limit.
- The August 13, 1996 hardness value was dropped from the dataset. It was an extreme outlier (approximately 10 times the average) on the high end. This would elevate the avg. hardness value.

4. **Implementation Plan**

The individual facility dissolved copper loads will be allocated based on the point source component load (WLA) listed in this TMDL, and the appropriate permits will be modified to adher to these allocations. The total dissolved copper loading from headwater, incremental and point source contributors should not exceed the TMDL load minus the margin of safety. When a discharger is found to be out of compliance with the permit requirement, an enforcement action should follow.

5. **Monitoring Plan**

In accordance with Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a comprehensive program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

REFERENCES

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Bayou Cocodrie Dissolved Oxygen TMDL Model. ftn Associates, Ltd., 1999.

Appendix